

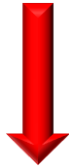


# MnRAM

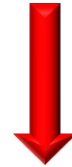
GIS Data and Techniques

# How Can GIS Help?

MnRAM questions can be answered multiple ways



GIS Alone



GIS & Field Work



Field Work Alone



# How Can GIS Help?

- GIS data can be used in a more cursory fashion
  - Quick snapshot
  - Perhaps less precise
- For users with more GIS experience, more in depth analysis can be performed
  - More precise answers
  - Takes more effort and knowledge

# DNR Data Deli



The screenshot shows a web browser window with the address bar displaying [deli.dnr.state.mn.us](http://deli.dnr.state.mn.us). The website has a yellow header with a hamburger icon and the title "The DNR Data Deli". Below the header is a navigation bar with links: Home, Data Catalog, Download Data, Data Status, Web Services, About, FAQ, and Contact Us. The "Download Data" link is highlighted with a red circle, and a red arrow points from it to a large red button labeled "Download Data" in the bottom right corner of the page.

Welcome to the Minnesota Department of Natural Resources [GIS Data Deli](#), an internet-based spatial data acquisition site that allows users to download raw computer-readable data for use in their Geographic Information System (GIS), image processing system, or traditional database environment. The site includes links to extensive and summary level data descriptions (metadata) to support our users.

**Current Status:** [The Deli is on-line.](#)

[Survey about your Air Photo Needs](#) (Open through Oct 15, 2012)

**Take the Survey**

MnGeo and the Minnesota Department of Natural Resources are heading an effort to make aerial imagery more affordable and accessible in Minnesota. Although there is much imagery available in Minnesota, the state has no sustainable program in place assuring that new imagery will be collected on a regular basis in the future.

The goal of this effort is to develop a statewide aerial imagery acquisition program that can meet the needs of the widest possible group of stakeholders.

Your response to this short survey will help us identify the most popular and suitable imagery and acquisition characteristics. Do you most need natural color or color-infrared imagery? Leaf-off or leaf-on? What resolution? Let us know!

Preliminary results will be presented at the Minnesota GIS/LIS Consortium Conference on October 5, 2012 and a full summary of survey results will be provided later this year, linked from the [MnGeo website survey page](#).

Thanks for your time and ongoing support! - *The Deli Team (09/19/2012)*

**quick downloads (less than 20Mb)**

2009 Wild and Scenic River Aerial Oblique CIR Photo Index  
please enter your email address  
[get data](#) [reset](#)

Note: This list is a subset of our complete data offerings.  
More data is available via the [Download Data](#) page.

**Download Data**

**If you are looking for LiDAR based elevation data products:**

- Please follow this link to the [MnGeo First Stop LiDAR Elevation Data](#) web page.


The MnGeo web page provides a complete rundown of all publicly available LiDAR data including those created, managed, and distributed by the DNR.

**Can't find the data you are looking for?** We've compiled a [list of other web sites where you can find Minnesota GIS data](#).

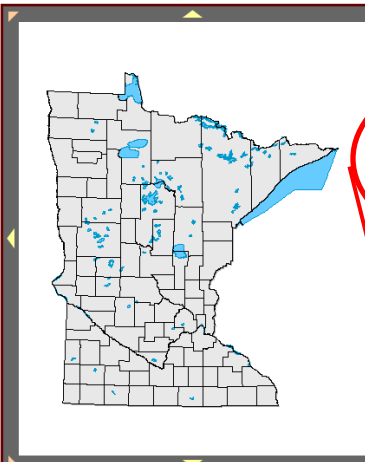
Contents © 1999-2012. Minnesota Department of Natural Resources  
Last site update: Mon Oct 22 08:15:01 CDT 2012

<http://deli.dnr.state.mn.us/>

# DNR Data Deli

 **The DNR Data Deli**

[Home](#) [Data Catalog](#) [Download Data](#) [Data Status](#) [Web Services](#) [About](#) [FAQ](#) [Contact Us](#)



0 31 62 93 mi  
0 48 96 144 km

**Search Options**

☒ by area/point  
☐ by name


**Thematic Classes**

All Classes

**Available Layers**

- 1995-1996 Landsat TM False Color Composite
- 1:100k Digital Raster Graphic - Collars Removed
- 1:24k Digital Raster Graphic - Collars Removed
- 1:250k Digital Raster Graphic - Collars Removed
- 2009 Wild and Scenic River Aerial Oblique CIR Photo Index

**Reference Map**



[Step-By-Step Instructions](#)

See a gray screen above? Please follow [these instructions](#) to confirm your browser's configuration. The deli is best viewed with Internet Explorer 6.x+ or Mozilla Firefox 1.x+.

**Thematic Classes**

All Classes

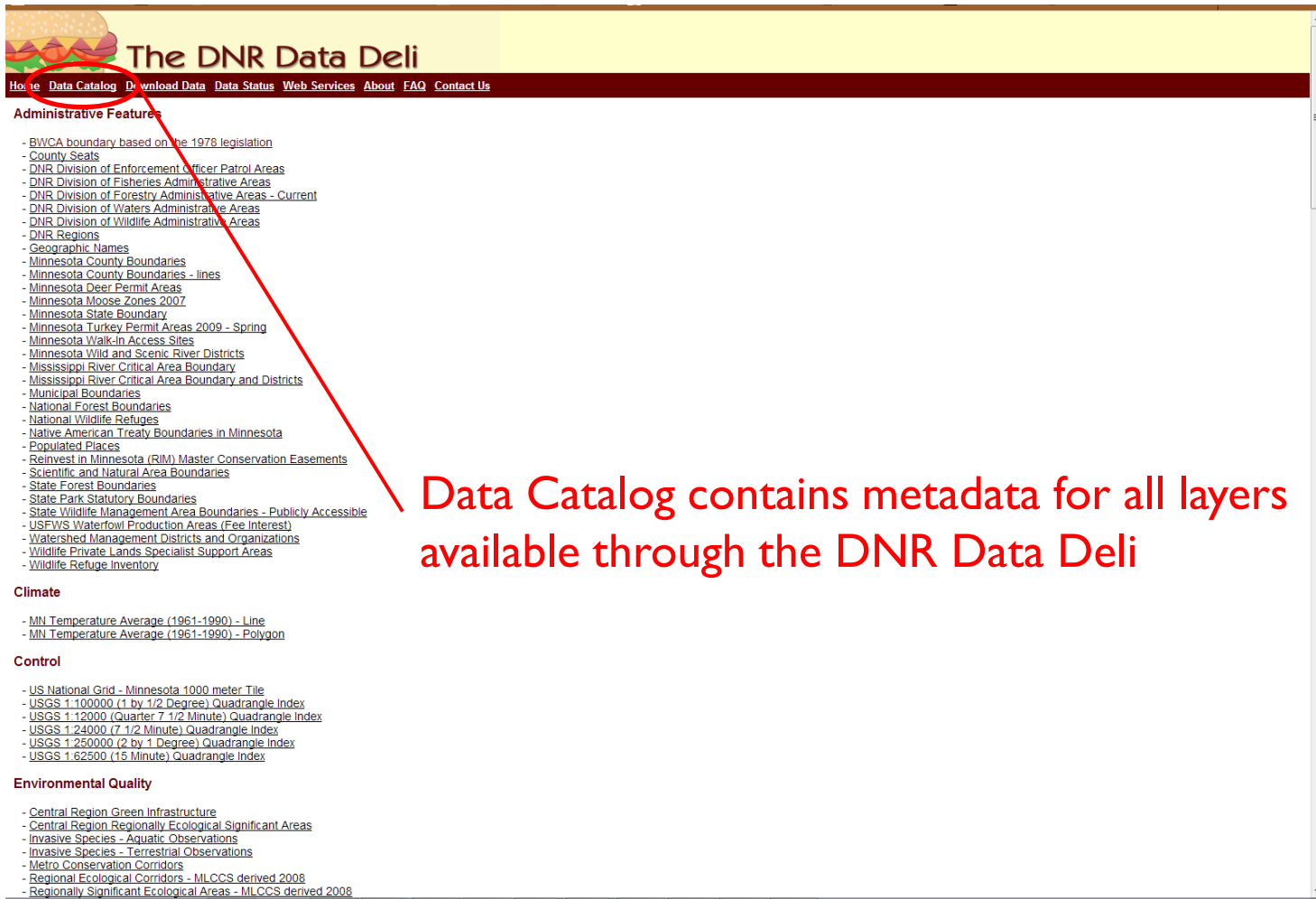
**Available Layers**

- 1995-1996 Landsat TM False Color Composite
- 1:100k Digital Raster Graphic - Collars Removed
- 1:24k Digital Raster Graphic - Collars Removed
- 1:250k Digital Raster Graphic - Collars Removed
- 2009 Wild and Scenic River Aerial Oblique CIR Photo Index

Contents © 1999-2012, Minnesota Department of Natural Resources  
Last site update: Mon Oct 22 06:15:01 CDT 2012

<http://deli.dnr.state.mn.us/>

# DNR Data Deli



**The DNR Data Deli**

[Home](#) [Data Catalog](#) [Download Data](#) [Data Status](#) [Web Services](#) [About](#) [FAQ](#) [Contact Us](#)

**Administrative Features**

- BWCA boundary based on the 1978 legislation
- County Seats
- DNR Division of Enforcement Officer Patrol Areas
- DNR Division of Fisheries Administrative Areas
- DNR Division of Forestry Administrative Areas - Current
- DNR Division of Waters Administrative Areas
- DNR Division of Wildlife Administrative Areas
- DNR Regions
- Geographic Names
- Minnesota County Boundaries
- Minnesota County Boundaries - lines
- Minnesota Deer Permit Areas
- Minnesota Moose Zones 2007
- Minnesota State Boundary
- Minnesota Turkey Permit Areas 2009 - Spring
- Minnesota Walk-in Access Sites
- Minnesota Wild and Scenic River Districts
- Mississippi River Critical Area Boundary
- Mississippi River Critical Area Boundary and Districts
- Municipal Boundaries
- National Forest Boundaries
- National Wildlife Refuges
- Native American Treaty Boundaries in Minnesota
- Populated Places
- Reinvest in Minnesota (RIM) Master Conservation Easements
- Scientific and Natural Area Boundaries
- State Forest Boundaries
- State Park Statutory Boundaries
- State Wildlife Management Area Boundaries - Publicly Accessible
- USFWS Waterfowl Production Areas (Fee Interest)
- Watershed Management Districts and Organizations
- Wildlife Private Lands Specialist Support Areas
- Wildlife Refuge Inventory

**Climate**

- MN Temperature Average (1961-1990) - Line
- MN Temperature Average (1961-1990) - Polygon

**Control**

- US National Grid - Minnesota 1000 meter Tile
- USGS 1:100000 (1 by 1/2 Degree) Quadrangle Index
- USGS 1:12000 (Quarter 7 1/2 Minute) Quadrangle Index
- USGS 1:24000 (7 1/2 Minute) Quadrangle Index
- USGS 1:250000 (2 by 1 Degree) Quadrangle Index
- USGS 1:62500 (15 Minute) Quadrangle Index

**Environmental Quality**

- Central Region Green Infrastructure
- Central Region Regionally Ecological Significant Areas
- Invasive Species - Aquatic Observations
- Invasive Species - Terrestrial Observations
- Metro Conservation Corridors
- Regional Ecological Corridors - MLCCS derived 2008
- Regionally Significant Ecological Areas - MLCCS derived 2008

**Data Catalog contains metadata for all layers available through the DNR Data Deli**

<http://deli.dnr.state.mn.us/>

# Special Features

(Issued 9/15/10)

## FUNCTIONAL ASSESSMENT - Special Features

**Is the wetland part of, or directly adjacent to, an area of special natural resource interest?**

Check those that apply:

- a. ☐ Designated trout streams or trout lakes (For Minnesota, see MnDNR Commissioners Order 2450 Part 6262.0400 subparts 3 and 5) *(if yes, Fish Habitat Rating is Exceptional)*.
- b. ☐ Calcareous fen (Special Status— For Minnesota, see MN Rule Chapter 7050) *(if yes, Vegetative Diversity/Integrity functional rating is Exceptional)*. Consult DNR for regulatory purposes.
- c. ☐ DNR designated scientific and natural area *(if yes, then Aesthetics/Recreation/Education/Cultural functional rating is Exceptional)*.
- d. ☐ Rare natural community. Defined as: a wetland native plant community having a state element rank of S1, S2, or S3<sup>1</sup> that is mapped or determined to be eligible for mapping in the Natural Heritage Information System (NHIS) maintained by the Minnesota Department of Natural Resources OR a wetland native plant community contained within an area mapped or determined to be eligible for mapping in the NHIS as a Site of Outstanding or High Biological Diversity.<sup>2</sup> *If present, then the ratings for Vegetative Diversity/Integrity and Wildlife Habitat are Exceptional (see MnRAM question 5). For Minnesota, refer to Minn. Rule Ch. 8420.0548, Subp. 3. This answer automatically makes the answer to #5 = "Yes."*
- e. ☐ High priority wetland, environmentally sensitive area or environmental corridor identified in a local water management plan.
- f. ☐ Public park, forest, trail or recreation area.
- g. ☐ State or Federal fish and wildlife refuges and fish and wildlife management areas, and water fowl protection areas *(if yes, then Wildlife and/or Fish Habitat functional rating is Exceptional)*.
- h. ☐ Archeological or historic site as designated by the State Historic Preservation Office *(if yes, then Aesthetics/Recreation/Education/Cultural functional rating is Exceptional)*.
- i. ☐ Plant species: naturally occurring, persistent populations that are<sup>3</sup>.

# Special Features

- Designated trout streams or trout lakes

## Thematic Classes

Hydrography ▼

## Available Layers

Major River Centerline Traces in Minnesota  
Migratory Waterfowl Feeding and Resting Areas  
**Minnesota Trout Streams**  
National Wetlands Inventory Lines  
National Wetlands Inventory Points

## Thematic Classes

Hydrography ▼

## Available Layers

Shallow Lakes Identified by DNR Wildlife  
Streams with Strahler Stream Order  
**Trout Lake Designation**  
Trout Stream Special Regulations  
Trout Stream Winter Regulations

- DNR designated scientific and natural area

## Thematic Classes

Administrative Features ▼

## Available Layers

Populated Places  
Reinvest in Minnesota (RIM) Master Conservation Easements  
**Scientific and Natural Area Boundaries**  
State Forest Boundaries  
State Park Statutory Boundaries

# Special Features

- Public park, forest, trail or recreation area.

## Thematic Classes

Administrative Features ▼

## Available Layers

Scientific and Natural Area Boundaries  
State Forest Boundaries  
State Park Statutory Boundaries  
State Wildlife Management Area Boundaries - Publicly Accessible  
USFWS Waterfowl Production Areas (Fee Interest)

## Thematic Classes

Facilities ▼

## Available Layers

DNR Site Locations  
Hunter Walking Trails  
Minnesota Snowmobile Trails  
Minnesota State Park Trails and Roads  
Minnesota State Trails

## Thematic Classes

Administrative Features ▼

## Available Layers

Reinvest in Minnesota (RIM) Master Conservation Easements  
Scientific and Natural Area Boundaries  
State Forest Boundaries  
State Park Statutory Boundaries  
State Wildlife Management Area Boundaries - Publicly Accessible

## Thematic Classes

Administrative Features ▼

## Available Layers

Mississippi River Critical Area Boundary and Districts  
Municipal Boundaries  
National Forest Boundaries  
National Wildlife Refuges  
Native American Treaty Boundaries in Minnesota

# Special Features

- State or Federal fish and wildlife refuges and fish and wildlife management areas, and water fowl protection areas

## Thematic Classes

Administrative Features ▼

## Available Layers

State Forest Boundaries  
State Park Statutory Boundaries  
State Wildlife Management Area Boundaries - Publicly Accessible  
USFWS Waterfowl Production Areas (Fee Interest)  
Watershed Management Districts and Organizations

## Thematic Classes

Administrative Features ▼

## Available Layers

State Wildlife Management Area Boundaries - Publicly Accessible  
USFWS Waterfowl Production Areas (Fee Interest)  
Watershed Management Districts and Organizations  
Wildlife Private Lands Specialist Support Areas  
Wildlife Refuge Inventory

## Thematic Classes

Administrative Features ▼

## Available Layers

Municipal Boundaries  
National Forest Boundaries  
National Wildlife Refuges  
Native American Treaty Boundaries in Minnesota  
Populated Places

## Thematic Classes

Administrative Features ▼

## Available Layers

State Park Statutory Boundaries  
State Wildlife Management Area Boundaries - Publicly Accessible  
USFWS Waterfowl Production Areas (Fee Interest)  
Watershed Management Districts and Organizations  
Wildlife Private Lands Specialist Support Areas

# Special Features

- Floodplain area identified in a zoning ordinance or map

## Thematic Classes

Hydrography

## Available Layers

FEMA DFIRM Station Start

FEMA DFIRM Study Info

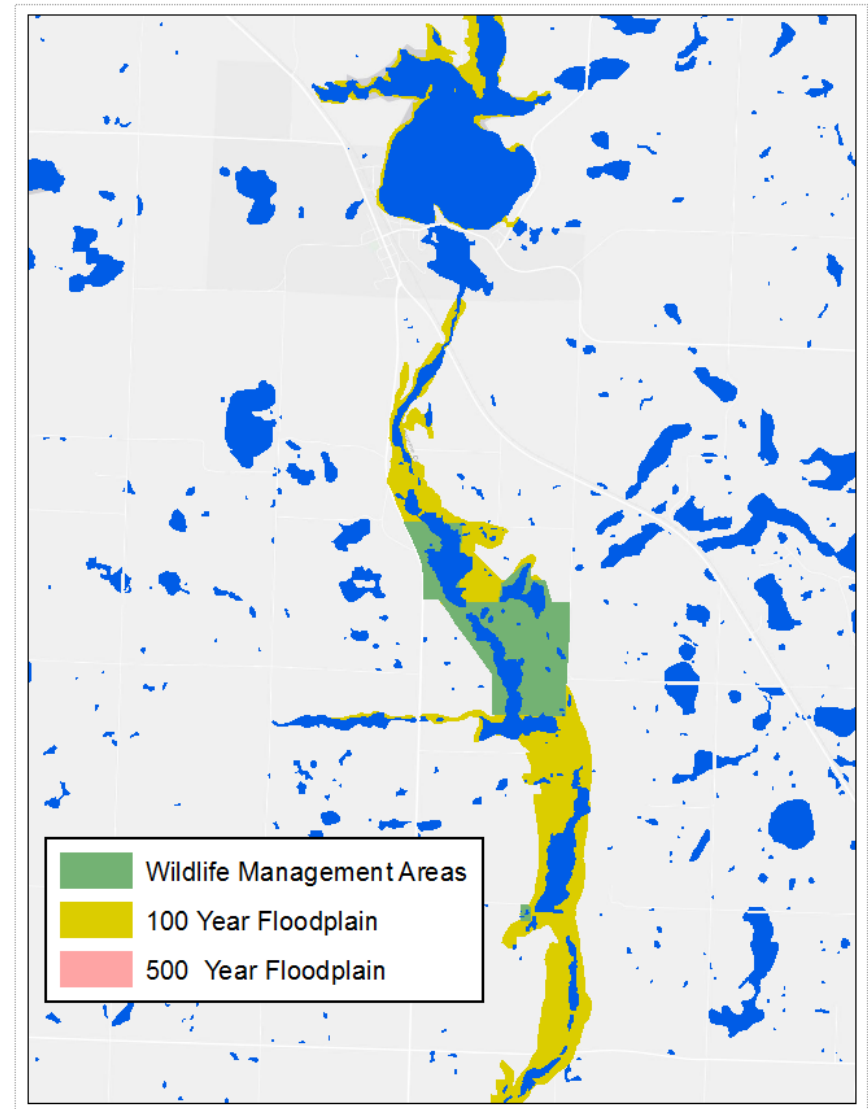
FEMA Q3 Floodways

Fisheries Reclamation Events

Lake Basin Fetch and Maximum Length/Width

# Special Features

- Example – Notice wetlands that are within or adjacent to a Wildlife Management Area, and/or a FEMA identified floodplain



# Wetlands Data

- Best available statewide wetlands data
  - National Wetlands Inventory (NWI)
  - Analysis performed from 1991 – 1994
- Obviously, field scale wetland polygon data should be used where possible
  - Local wetland delineations
- Some questions may be answered without wetland data
  - Depends on level of GIS experience

# Wetlands Data

- DNR Data Deli:

## Thematic Classes

---

Hydrography



## Available Layers

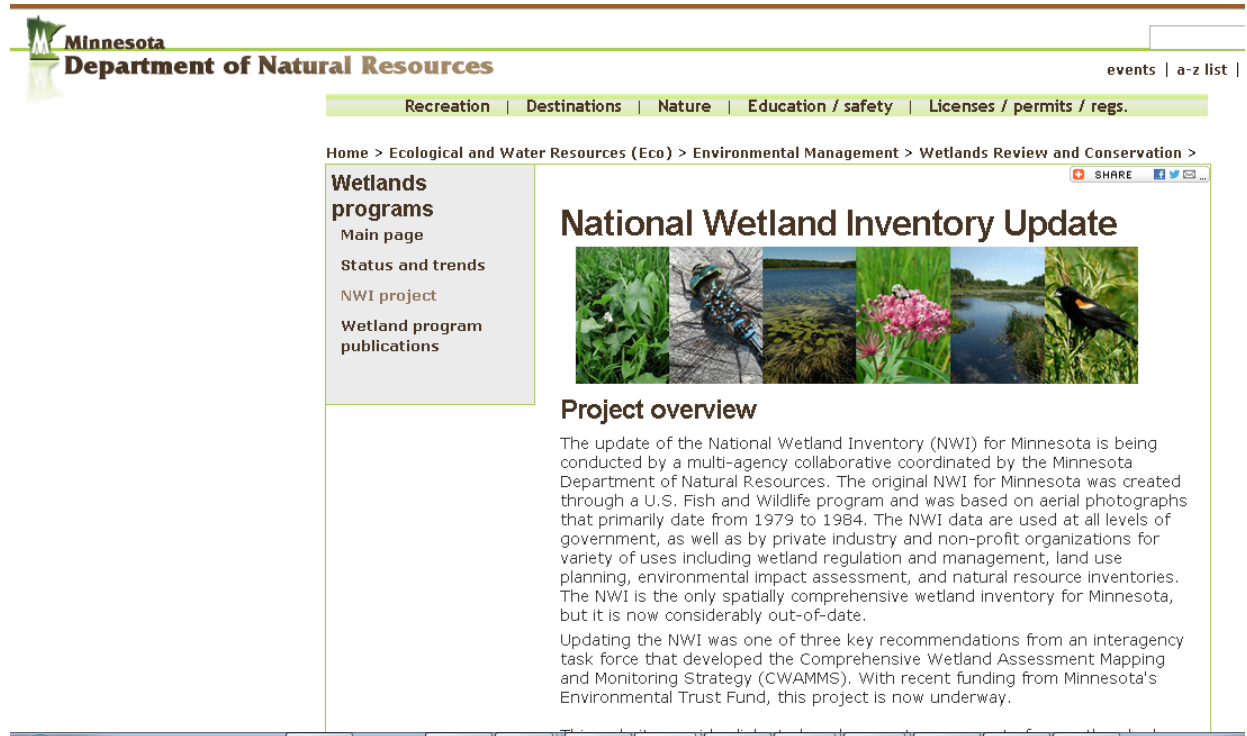
---

National Wetlands Inventory Lines  
National Wetlands Inventory Points  
National Wetlands Inventory Polygons  
PLS Sections with Designated Trout Streams  
Public Waters Inventory (PWI) Basin Delineations



# NWI Update

- Effort by DNR and partners to update the NWI
- Estimated completion by 2019



The screenshot displays the Minnesota Department of Natural Resources website. The header includes the state logo and the department name. A navigation bar lists various categories: Recreation, Destinations, Nature, Education / safety, and Licenses / permits / regs. The main content area is titled 'National Wetland Inventory Update' and features a collage of five images: a green plant, a dragonfly, a wetland landscape, pink flowers, and a black bird. Below the images, the 'Project overview' section explains that the update of the National Wetland Inventory (NWI) for Minnesota is being conducted by a multi-agency collaborative. It notes that the original NWI was created through a U.S. Fish and Wildlife program and is now out-of-date. The update is part of a larger effort to develop a Comprehensive Wetland Assessment Mapping and Monitoring Strategy (CWAMMS).

**Wetlands programs**  
Main page  
Status and trends  
NWI project  
Wetland program publications

## National Wetland Inventory Update

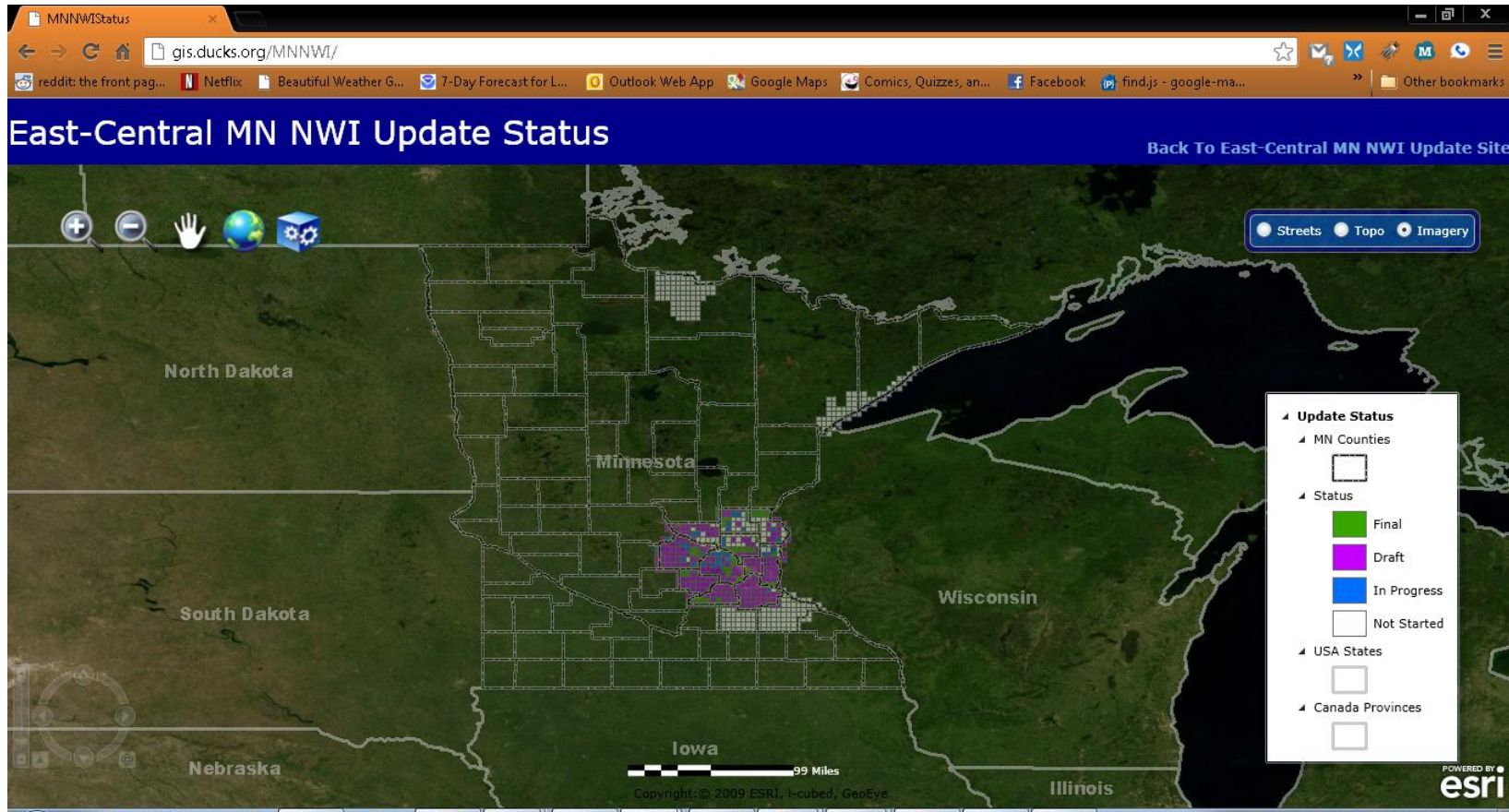
**Project overview**

The update of the National Wetland Inventory (NWI) for Minnesota is being conducted by a multi-agency collaborative coordinated by the Minnesota Department of Natural Resources. The original NWI for Minnesota was created through a U.S. Fish and Wildlife program and was based on aerial photographs that primarily date from 1979 to 1984. The NWI data are used at all levels of government, as well as by private industry and non-profit organizations for variety of uses including wetland regulation and management, land use planning, environmental impact assessment, and natural resource inventories. The NWI is the only spatially comprehensive wetland inventory for Minnesota, but it is now considerably out-of-date.

Updating the NWI was one of three key recommendations from an interagency task force that developed the Comprehensive Wetland Assessment Mapping and Monitoring Strategy (CWAMMS). With recent funding from Minnesota's Environmental Trust Fund, this project is now underway.

[http://www.dnr.state.mn.us/eco/wetlands/nwi\\_proj.html](http://www.dnr.state.mn.us/eco/wetlands/nwi_proj.html)

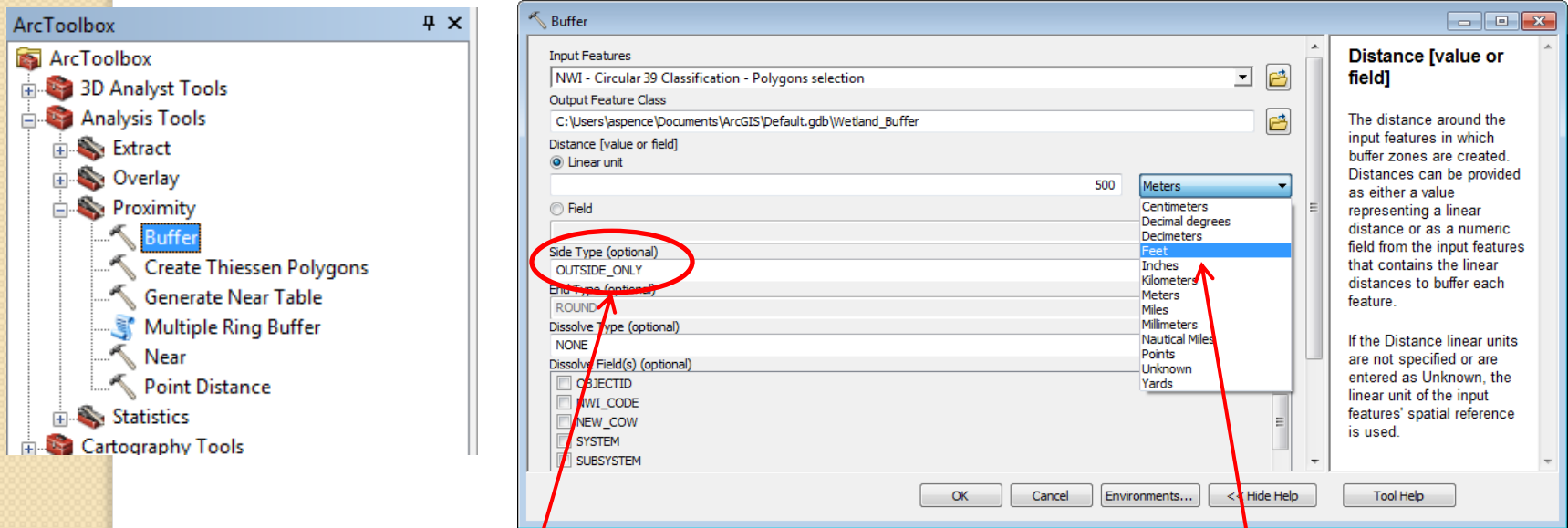
# NWI Update Status



<http://gis.ducks.org/MNNWI/>

# Buffering Wetland Data

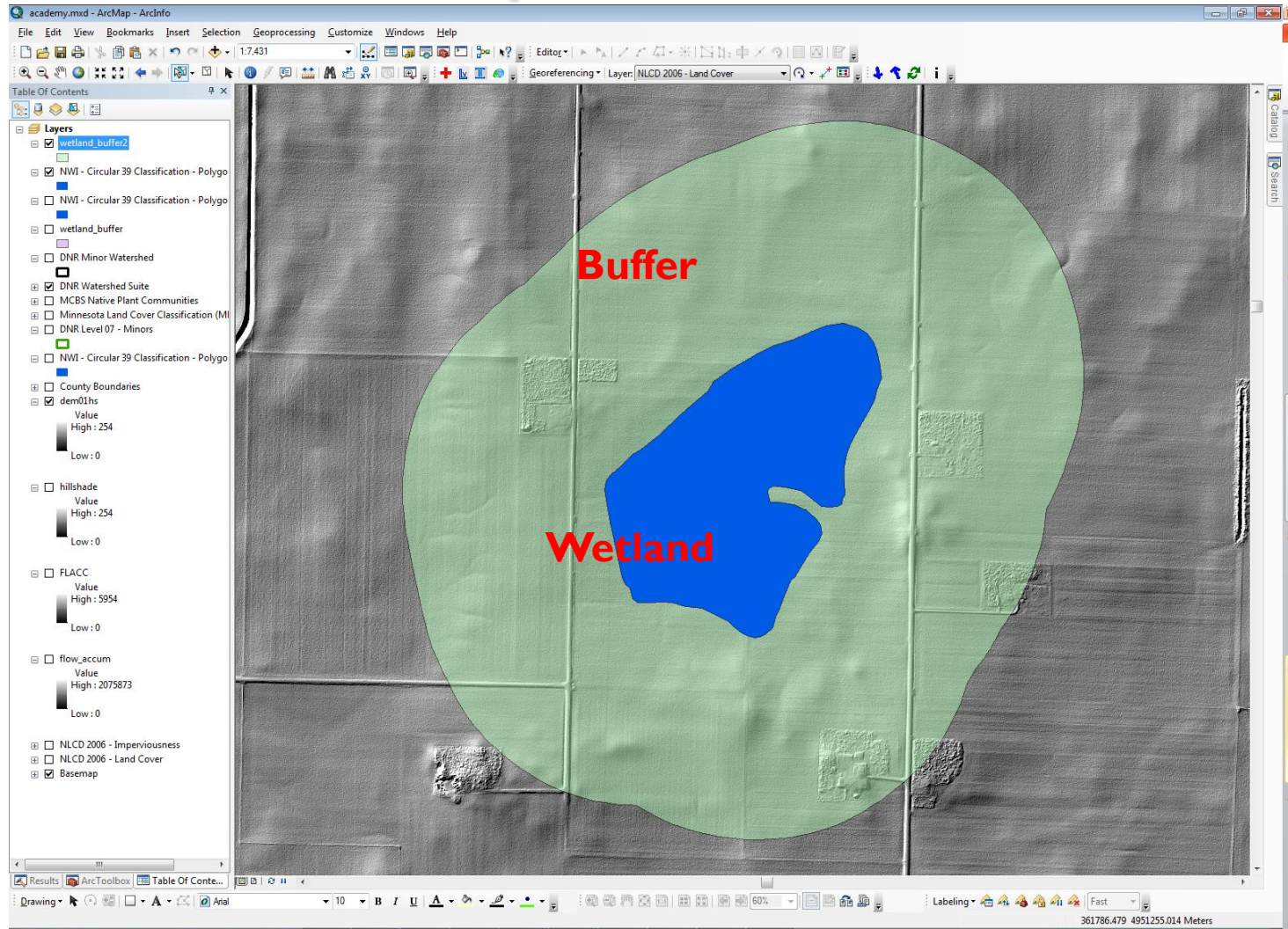
- Create a 500 foot buffer of wetland data, using ArcGIS “Buffer” tool, for subsequent analysis



**Choose “Outside\_Only” for Side Type (polygon data)**

**Select “Feet” for units**

# Buffer Example



# Soils Data

- Visit the NRCS Soil Data Mart:
  - <http://soildatamart.nrcs.usda.gov/>
- Select the state and survey area of interest
- Download both tabular and spatial data

# Soils Data

United States Department of Agriculture  
Natural Resources  
Conservation Service

MN033 - Cottonwood County, Minnesota  
Minnesota

Soil Data Mart  
Logon/Register Help

[Home](#) [Select State](#) [State Contacts](#) [Template Databases](#) [SSURGO Metadata](#) [Status Map](#) [US General Soil Map](#)

Please select the class of data you wish to download: ( Survey Area Version 11 , Tabular Version 10 , Spatial Version 5 )

☐ Tabular Data Only ☒ Tabular and Spatial Data ☐ Spatial Data Only ☐ Template Database Only

Please select a spatial format:

Please select a coordinate system:

Please select a template database (optional):

State	MS Access Version	Template DB Version	Template DB Name	Size
US	Access 2002	35	soildb_US_2002	1.7M
US	Access 2002	34	soildb_US_2002	1.7M
US	Access 2000	34	soildb_US_2000	1.6M
US	Access 2002	33.2	soildb_NPS_2002	2.4M
AK	Access 2002	32.15	soildb_AK_2002	2.5M
CA	Access 2002	33.2	soildb_CA_2003	1.8M
CA	Access 2000	33.2	soildb_CA_2000	1.8M
CA	Access 2002	32.1	soildb_CA_2002	1.8M
CT	Access 2002	32.1	soildb_CT_2002	1.8M
DC	Access 2002	31	soildb_DC_2002	1.7M
GA	Access 2002	32	soildb_GA_2002	1.8M
GA	Access 2002	31	soildb_GA_2002	1.5M
GA	Access 97	31	soildb_GA_97	1.3M
ID	Access 2002	33.4	soildb_ID_2003	1.9M
ID	Access 2000	33.4	soildb_ID_2000	2.3M
IN	Access 2002	33	soildb_IN_2002	1.7M
IN	Access 2000	33	soildb_IN_2000	1.7M
IN	Access 97	33	soildb_IN_97	1.4M
IN	Access 2002	32	soildb_IN_2002	1.7M
IA	Access 2002	32.1	soildb_IA_2002	1.8M
IA	Access 2002	31.3	soildb_IA_2002	1.4M

**Description:** Custom Access Template Version 31 for Georgia. Several reports not applicable to Georgia have been disabled in the template report list. Reports with (GA) following the report name have been locally customized for use in Georgia.

Please enter your e-mail address:

If the e-mail account entered above is protected by spam blocking software, you will need to authorize e-mail from SoilDataMart@nrcs.usda.gov in order to receive e-mail notification once your request has been processed.

[Back to Top](#) [FOIA](#) | [Information Quality](#) | [Accessibility Statement](#) | [Privacy Policy](#) | [Non-Discrimination Statement](#)  
[White House](#) | [USA.gov](#) | [USDA](#) | [NRCS](#) | [NRCS Soils](#) | [Disclaimer](#) | [Contact Us](#)

<http://soildatamart.nrcs.usda.gov/>

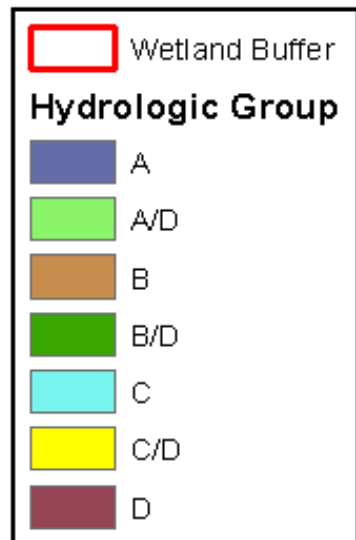
# Soils Data

- MnRAM question #19
  - Describe the predominant upland soils within the wetland's immediate drainage area that affect the overland flow characteristics to the wetland
  - Evaluate soils within the 500 foot wetland buffer and determine dominant hydrologic soil group

# Soils Data

- The SSURGO database table named “muaggatt” contains a column named “hydgrpdc”
- This describes the soil map unit’s hydrologic group which is used to answer this MnRAM question
- Join this table to downloaded GIS spatial data to analyze upland soils

# Soils Data



# Soils Data

- MnRAM question #28
  - Describe the soils within the wetland
  - Evaluate the SSURGO soils within the wetland boundary to determine if the majority of the soils are mineral (recharge) or organic (discharge)

# Soils Data

- MnRAM question #30
  - Indicate conditions that best fit the wetland based on wetland size and the hydrologic properties of the soils within 500 feet of the wetland
  - Similar to question #19, use a 500 foot wetland buffer to determine if the majority of surrounding soils, for wetlands less than 200 acres, are within hydrologic group A or B

# Soils Data

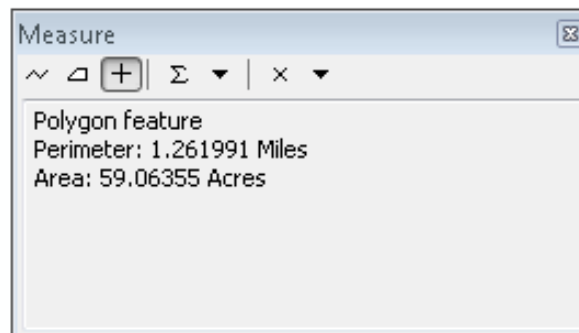
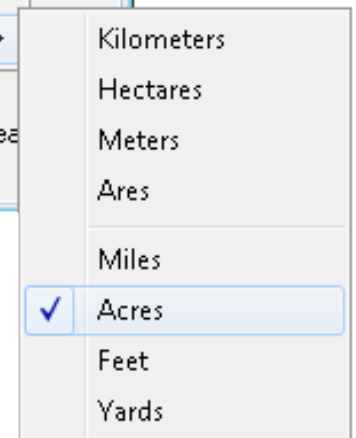
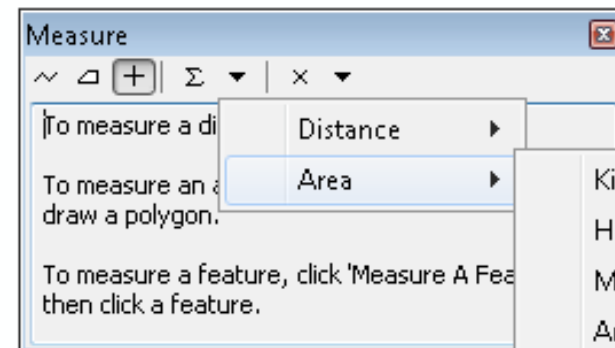
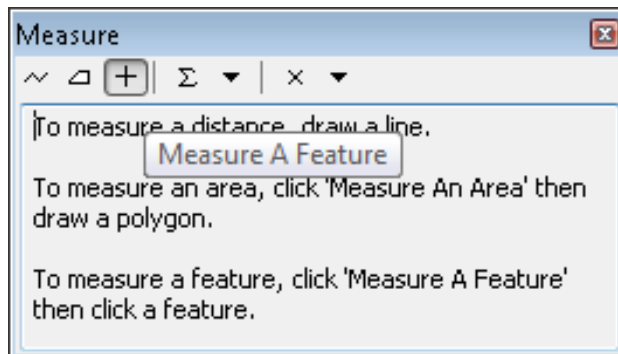
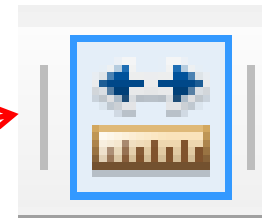
- MnRAM question #60
  - Indicate conditions that best fit the wetland based on wetland size and the hydrologic properties of the upland soils within 500 feet of the wetland

# Soils Data

- MnRAM question #60
  - Again, similar to question #19
- Recharge = Wetland is <200 acres and surrounding soils (within 500 feet) are primarily in the C or D hydrologic groups.
- Discharge = Wetland is >200 acres in size or wetland is <200 acres and the surrounding soils (within 500 feet) are primarily in the A or B hydrologic groups.

# Soils Data

## Measure Tool



# Watershed Data

- DNR Data Deli:

## Thematic Classes

---

Hydrography



## Available Layers

---

DNR Watersheds - DNR Level 02 - HUC 04

DNR Watersheds - DNR Level 04 - HUC 08 - Majors

DNR Watersheds - DNR Level 07 - Minors

DNR Watersheds - DNR Level 08 - All Catchments

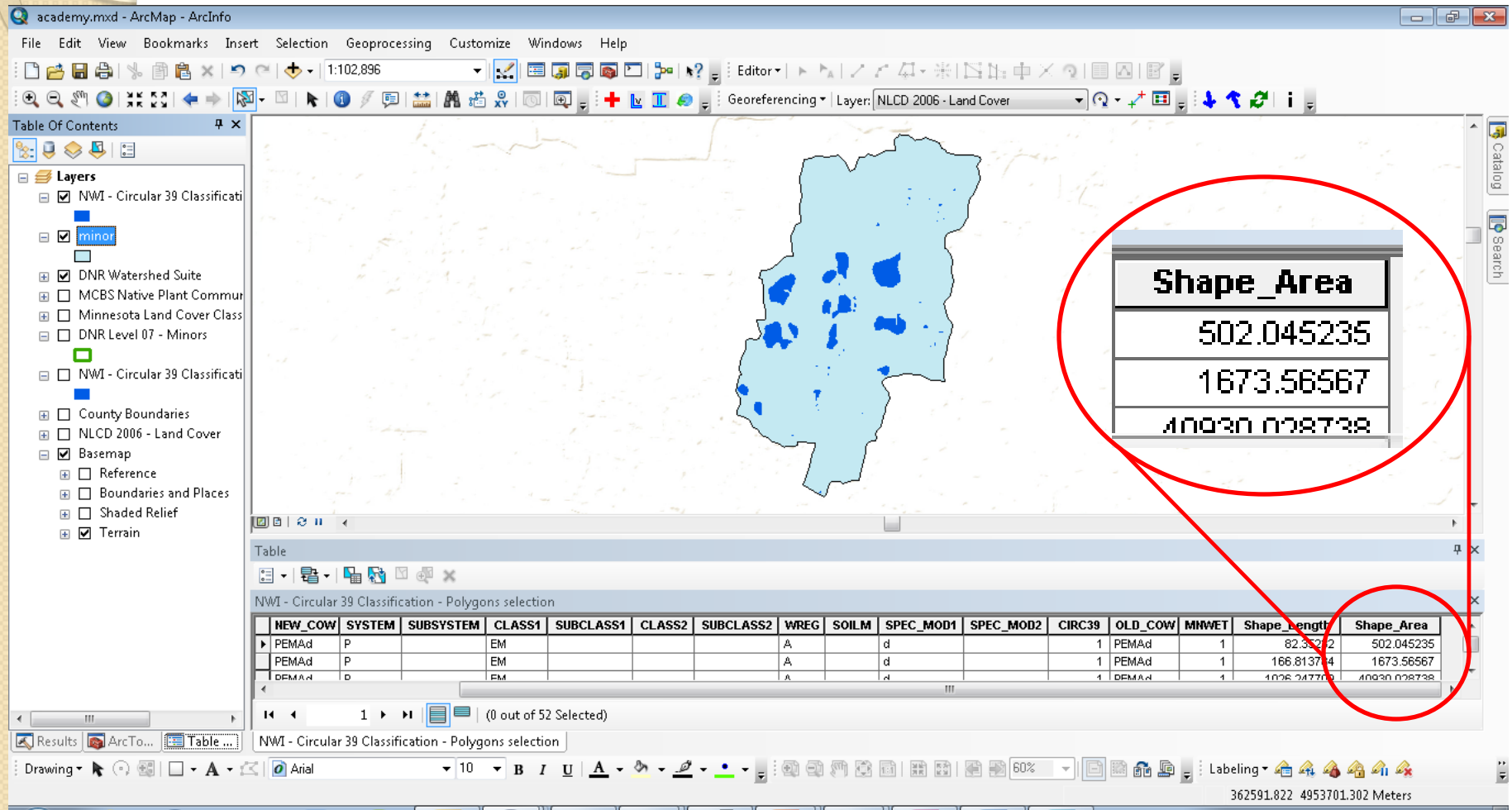
Designated Wildlife Lakes



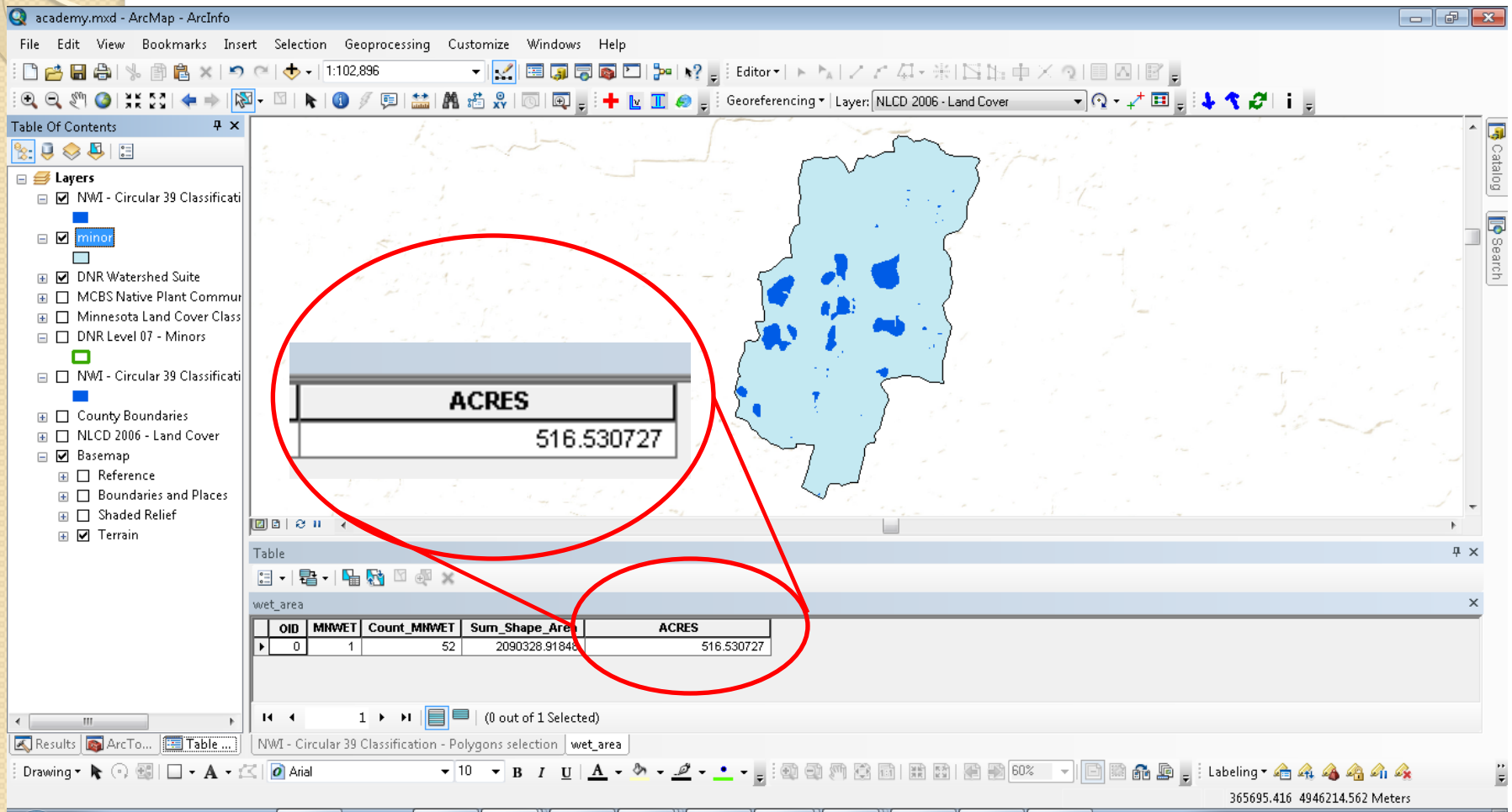
# Watershed Data

- MnRAM question #21
  - Describe the proportion of wetlands in the minor watershed
  - Clip wetland (and other appropriate hydrologic data such as lakes and ponds) to designated subwatershed
  - Derive percent area of water within the subwatershed
  - A visual examination, and educated guess can be used in lieu of GIS analysis

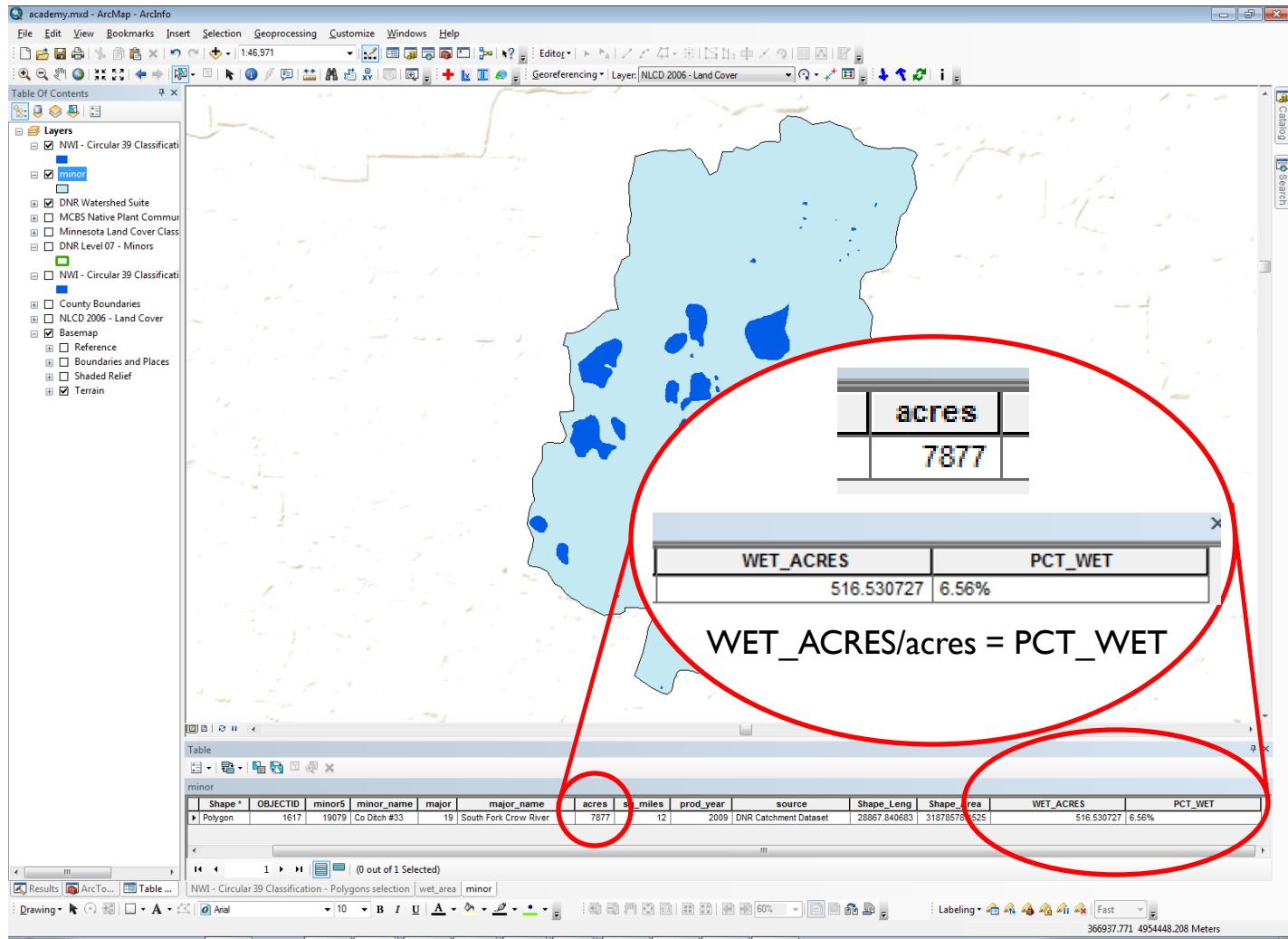
# Watershed Data



# Watershed Data



# Watershed Data



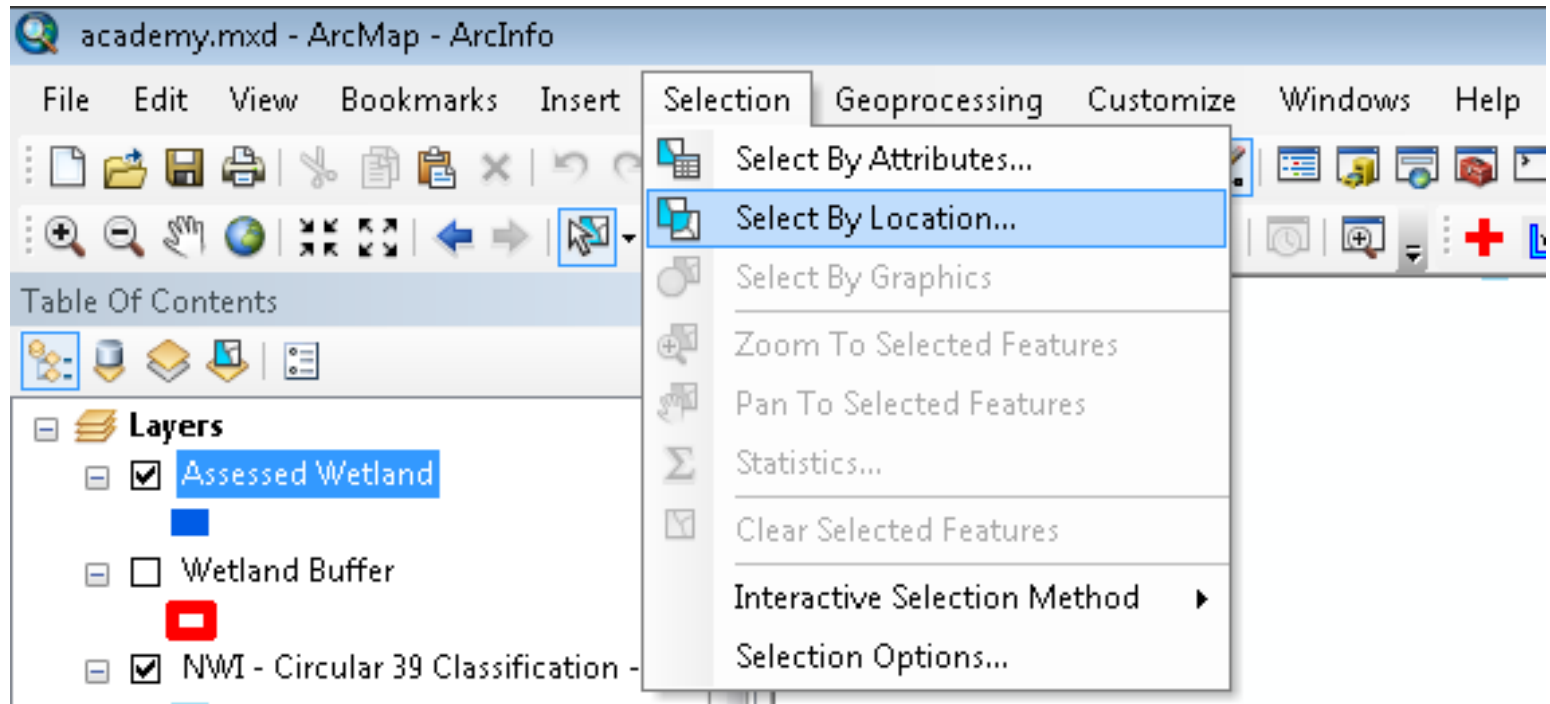
# Watershed Data

- MnRAM question #40
  - Describe the relative interspersion of various wetlands in the vicinity of the assessment wetland
    - Uses number of wetlands within 0.5 mile of the assessed wetland

# Watershed Data

- MnRAM question #40
- Method 1
  - Use the measure tool to measure out 0.5 miles from the wetland
- Method 2
  - Use the select by location ArcGIS tool to select all wetlands (from NWI or other wetland data source) that intersect the buffer

# Select By Location



# Select By Location



Select By Location

Select features from one or more target layers based on their location in relation to the features in the source layer.

Selection method:  
select features from

Target layer(s):

- ☐ Assessed Wetland
- ☐ Wetland Buffer
- ☒ NWI - Circular 39 Classification - Polygons
- ☐ DNR 24k River and Stream Centerlines
- ☐ DNR 24K Perennial Stream Centerlines
- ☐ Renville
- ☐ DNR Level 07 - Minors
- ☐ contours
- ☐ Wildlife Management Areas
- ☐ FEMA Q3 Floodways
- ☒ DNR Watershed Suite

☐ Only show selectable layers in this list

Source layer:  
Assessed Wetland

☐ Use selected features (0 features selected)

Spatial selection method:  
Target layer(s) features intersect the Source layer feature

☒ Apply a search distance  
0.5 Miles

Help OK Apply Close

# Land Cover

- Most recent statewide land cover data set is the USGS National Land Cover Database (NLCD)
  - 30 Meter data
- Most recent iteration of this data is from 2006
- Includes a data set for impervious surfaces only

# National Land Cover Database

The screenshot displays the National Land Cover Database (NLCD) website. At the top, a banner reads "Multi-Resolution Land Characteristics Consortium (MRLC)" above the "National Land Cover Database (NLCD)" title. A navigation bar includes links for Home, Find Data, Resources, FAQ, About Us, and Contact Us. A sidebar on the left lists categories: NLCD 2006, NLCD 2001, Retrofit Land Cover Change, and NLCD 1992, each with sub-links for Product Description, Data Downloads, Legend, Statistics, and References. The main content area is titled "National Land Cover Database 2006 (NLCD2006)" and "Product Data Downloads". It includes a note about using NLCD2001 Version 2.0 products for comparison. Below this, a section for "Conterminous United States" lists three products: "NLCD2006 Land Cover" (1.1Gb), "NLCD2006 Land Cover Change" (99.5MB), and "NLCD2006 Percent Developed Imperviousness" (696MB). A section for "NLCD2006 Supplementary Layers" lists four products: "NLCD2001/2006 Percent Developed Imperviousness Change" (40MB), "NLCD2006 Maximum Potential Spectral Change" (514MB), "NLCD2006 From - To Change Index" (1.25Gb), and "NLCD2006 Path/Row Index" (20MB). Each product entry includes a small thumbnail image and a brief description.

Multi-Resolution Land Characteristics Consortium (MRLC)  
National Land Cover Database (NLCD)

Home Find Data Resources FAQ About Us Contact Us

**NLCD 2006**  
Product Description  
Data Downloads  
Legend  
Statistics  
References

**NLCD 2001**  
Product Description  
Data Downloads  
Legend  
Statistics  
References

**Retrofit Land Cover Change**  
Product Description  
Data Downloads  
Legend  
References

**NLCD 1992**  
Product Description  
Data Downloads  
Legend  
Statistics  
References

**National Land Cover Database 2006 (NLCD2006)**

**Product Data Downloads**

NOTE: NLCD2001 Version 2.0 products must be used in any comparison of NLCD2001 and NLCD2006 products.

**Conterminous United States**

**NLCD2006 Land Cover** (1.1Gb)  
The 2006 land cover layer for the conterminous United States for all pixels.

**NLCD2006 Land Cover Change** (99.5MB)  
Land cover layer containing only those pixels identified as changed between NLCD2001 Land Cover Version 2.0 and NLCD2006 Land Cover products for the conterminous United States.

**NLCD2006 Percent Developed Imperviousness** (696MB)  
An updated circa 2006 percent developed imperviousness estimate layer for the conterminous United States for all pixels.

**NLCD2006 Supplementary Layers**

**NLCD2001/2006 Percent Developed Imperviousness Change** (40MB)  
Contains the difference in percent developed imperviousness pixels that changed between NLCD2001 percent developed imperviousness (version 2.0), and NLCD2006 percent developed imperviousness.

**NLCD2006 Maximum Potential Spectral Change** (514MB)  
A raster layer containing all pixels identified in the raw change detection process. Raw change includes areas of biomass increase and biomass decrease. Only a portion of these pixels were ultimately selected as real change during our final protocols.

**NLCD2006 From - To Change Index** (1.25Gb)  
A raster layer identifying a from and to land cover class index value label for each pixel in the conterminous United States based on a matrix for all possible land cover class label change combinations.

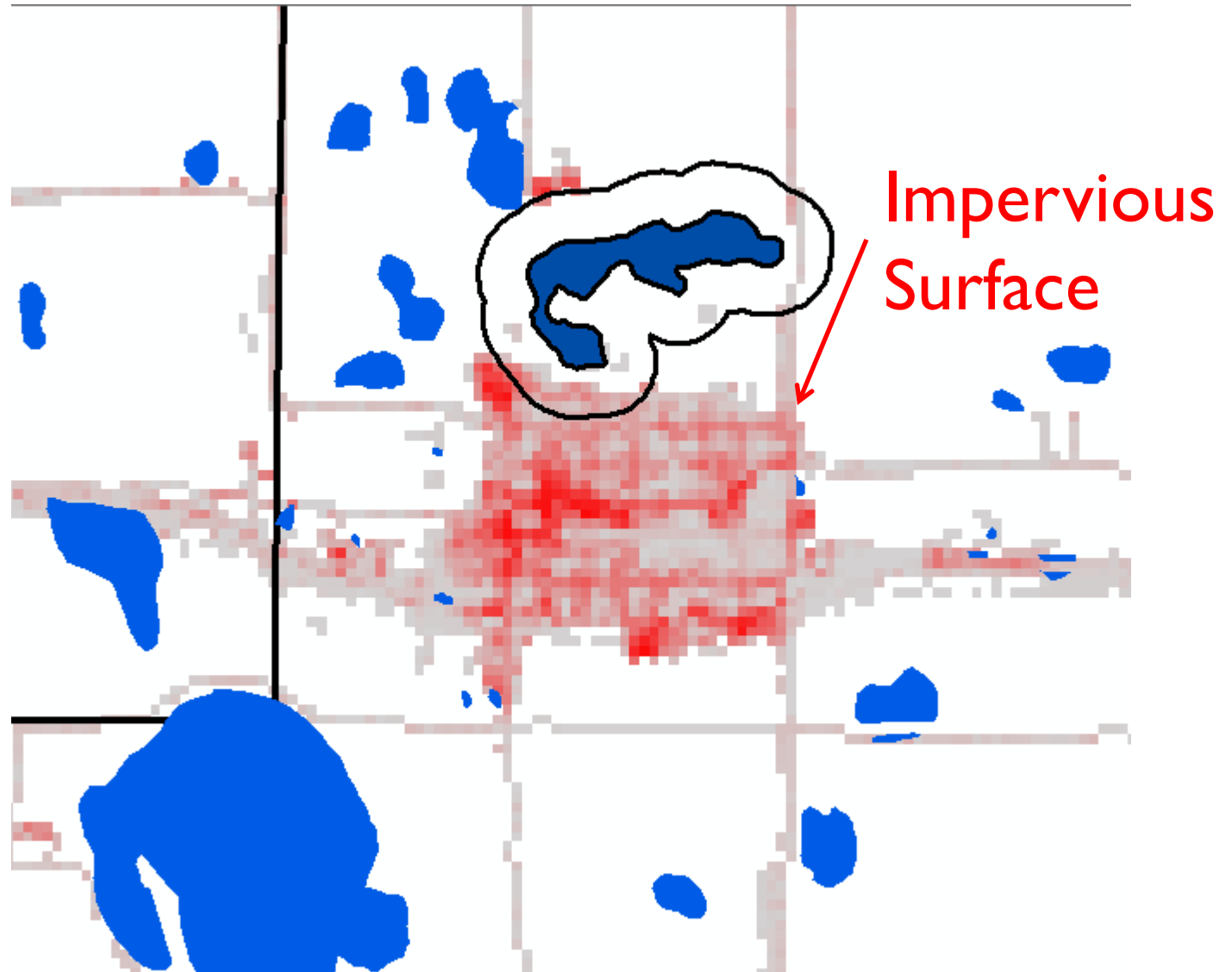
**NLCD2006 Path/Row Index** (20MB)  
Landsat scene pair footprints that include a Landsat acquisition date and scene identification number for each scene pair used in the production of the NLCD06 change analysis and land cover modeling process.

<http://www.mrlc.gov/>

# National Land Cover Database

- NLCD data can be used to help answer MnRAM questions:
  - #14: Describe the dominant land use and condition of the immediate upland drainage area of wetland
    - Question uses Impervious Surface as metric
  - #59: Land Use/Runoff
    - Question uses Impervious Surface as metric

# National Land Cover Database

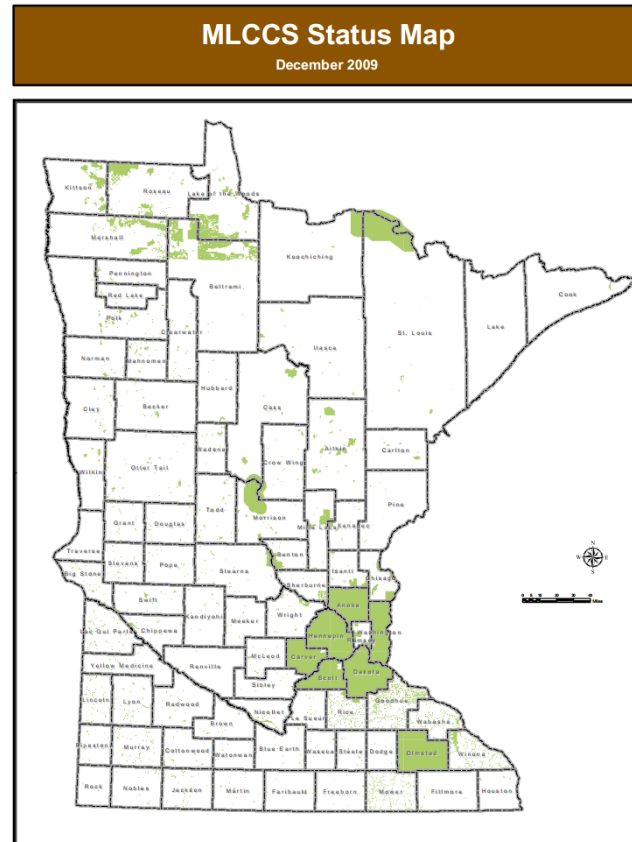


# National Land Cover Database

- Clip NLCD data to the 500 foot wetland buffer
  - Use Spatial Analyst “Extract by Mask” tool
  - Will show example later
- Summarize impervious surface percentage within clipped area by impervious value (percentage)

# Minnesota Land Cover Classification System (MLCCS)

- Also contains classes for percent impervious
- Data is not available statewide



# Minnesota Land Cover Classification System (MLCCS)

## Thematic Classes

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Land Cover



## Available Layers

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GAP Land Cover - Tiled Raster

GAP Land Cover - Vector

International Coalition Land Use/Land Cover

Land Cover - Minnesota Land Cover Classification System

LandSat-Based Land Use-Land Cover (Raster)

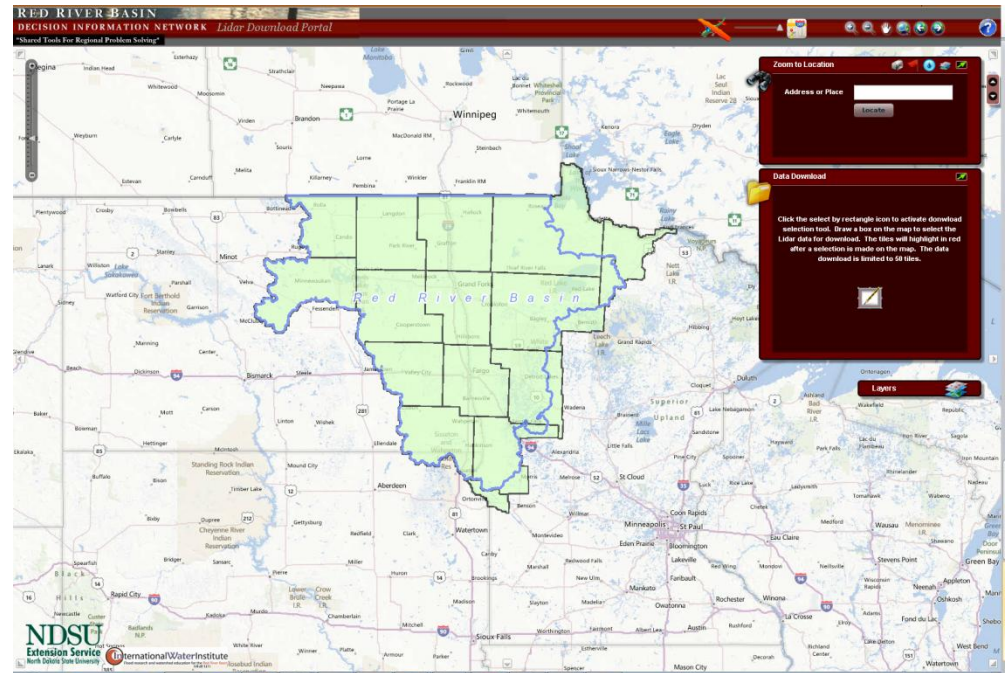


# Topography

- LiDAR
  - More accurate, more processing time
  - Suggest using 3 meter DEM to ease processing
- 30 Meter USGS Digital Elevation Model
  - Less accurate, less processing time

# LiDAR

- If in the Red River Valley basin
  - Use the International Water Institute's LiDAR Download Portal



<http://gis.rrbdin.org/lidardownload/>










# LiDAR

- If in any other portion of the state
  - Use the DNR's LiDAR FTP site

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## Index of /

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Name	Size	Date Modified
 data/		10/17/12 9:35:00 AM
 documentation/		10/23/12 12:28:00 PM
 examples/		7/10/12 3:34:00 PM
 LiDAR Data Change Log.docx	39.5 kB	10/19/12 11:05:00 AM
 lidar_xcopy.bat	276 B	10/10/12 2:49:00 PM
 readme_first.rtf	55.0 kB	6/22/11 11:51:00 AM
 tools/		7/20/12 2:02:00 PM
 training/		3/9/12 10:57:00 AM
 watchme_first.swf	9.3 MB	4/6/11 4:03:00 PM

<ftp://lidar.dnr.state.mn.us/>

# LiDAR

- Within the DNR LiDAR FTP site find county wide, mosaiced data sets in /data/county/

## Index of /data/county/






Name	Size	Date Modified
 [parent directory]		
 anoka_tile_index_map.pdf	4.8 MB	9/27/12 9:54:00 AM
 becker/		10/22/12 10:12:00 AM
 beltrami/		9/17/12 9:05:00 AM
 benton/		10/16/12 12:47:00 PM
 bigstone/		10/22/12 10:09:00 AM
 blue_earth/		8/17/12 2:48:00 PM
 brown/		8/15/12 10:04:00 AM
 carlton/		7/25/12 3:28:00 PM
 carver_tile_index_map.pdf	3.7 MB	9/27/12 10:01:00 AM
 chippewa/		7/6/12 11:42:00 AM
 chisago/		7/12/12 10:43:00 AM
 clay/		9/17/12 9:12:00 AM
 clearwater/		9/14/12 4:02:00 PM
 cook/		7/9/12 12:50:00 PM
 cottonwood/		7/6/12 11:42:00 AM
 county_mosaic_readme_first.rtf	643 kB	3/21/12 9:15:00 AM
 crowwing/		8/17/12 2:49:00 PM
 dakota_tile_index_map.pdf	6.2 MB	9/27/12 9:58:00 AM
 dodge/		8/23/12 9:41:00 AM

<ftp://lidar.dnr.state.mn.us/>

# LiDAR

- To download individual LiDAR tiles, look in the folder /data/q250k/
  - Note: use the tile index shapefile to identify the tile(s) you need to download

## Index of /data/county/

Name	Size	Date Modified
 [parent directory]		
 <a href="#">anoka_tile_index_map.pdf</a>	4.8 MB	9/27/12 9:54:00 AM
 <a href="#">becker/</a>		10/22/12 10:12:00 AM
 <a href="#">beltrami/</a>		9/17/12 9:05:00 AM
 <a href="#">benton/</a>		10/16/12 12:47:00 PM
 <a href="#">bigstone/</a>		10/22/12 10:09:00 AM
 <a href="#">blue_earth/</a>		8/17/12 2:48:00 PM

<ftp://lidar.dnr.state.mn.us/>

# USGS 30m DEM

- USGS Digital Elevation Model

## Thematic Classes

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Topography



## Available Layers

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Metro Region Elevation Contours

Metro Region Spot Elevations

Minnesota Digital Elevation Model - Tiled 30 Meter Resolution

Minnesota Digital Elevation Model - Tiled 93 Meter Resolution

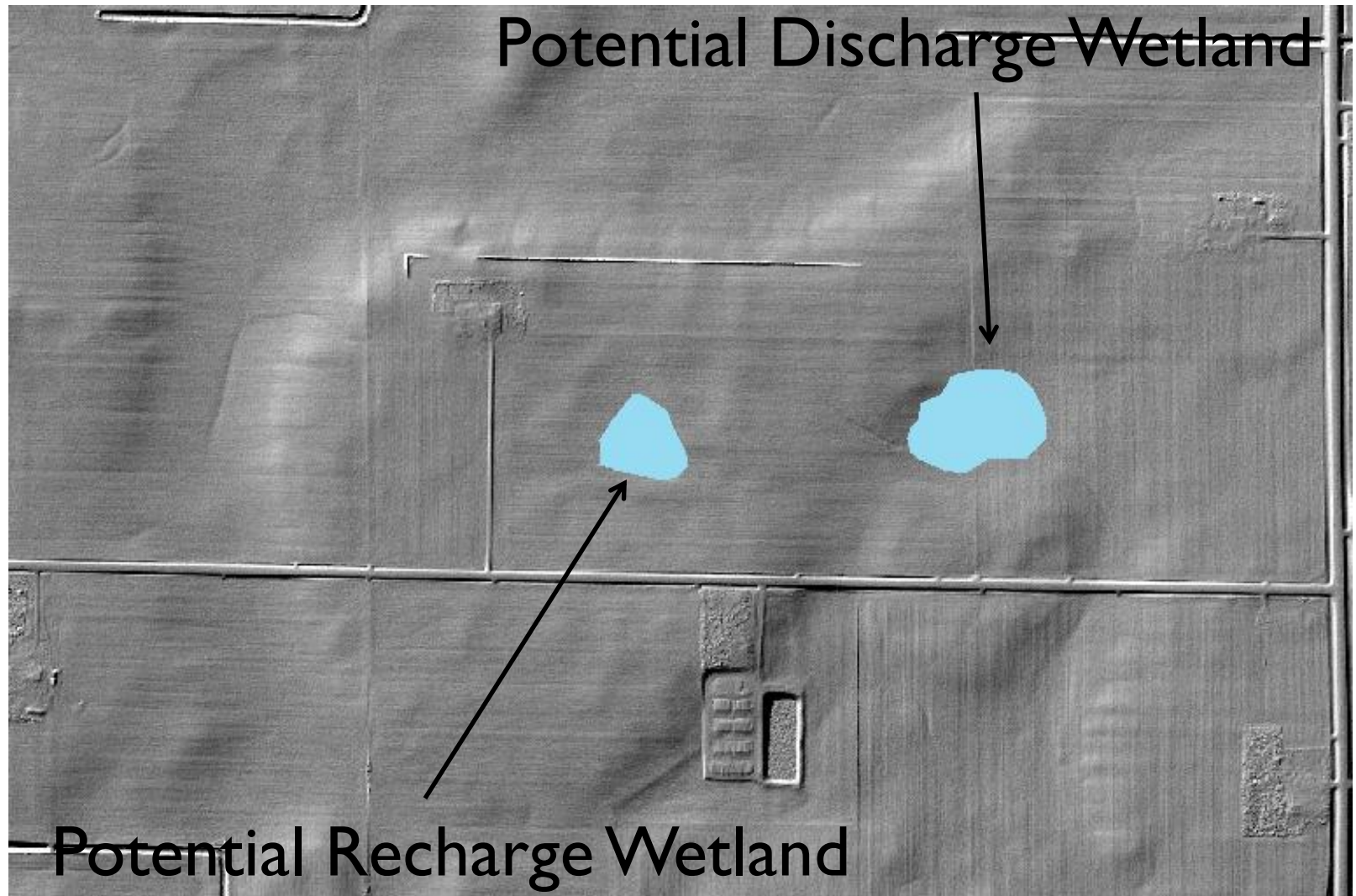
Shaded Relief of Minnesota Elevation - Black & White



# Topography

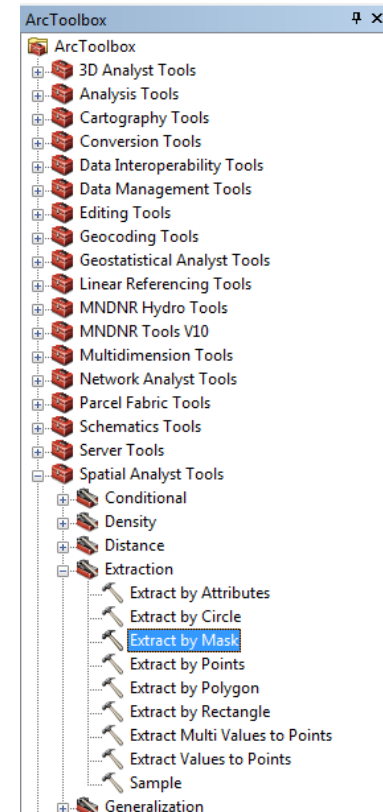
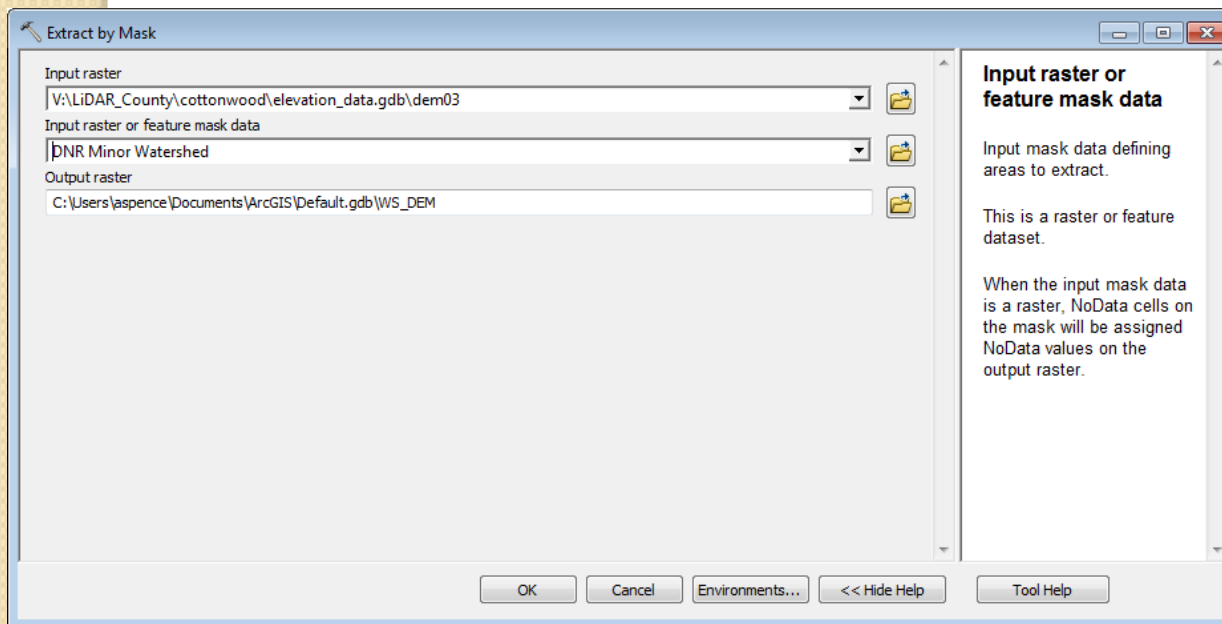
- Topography data can be used to answer MnRAM questions:
  - # 26: Adjacent Upland Slope
  - # 63: Characterize the topographic relief surrounding the wetland

# Topography



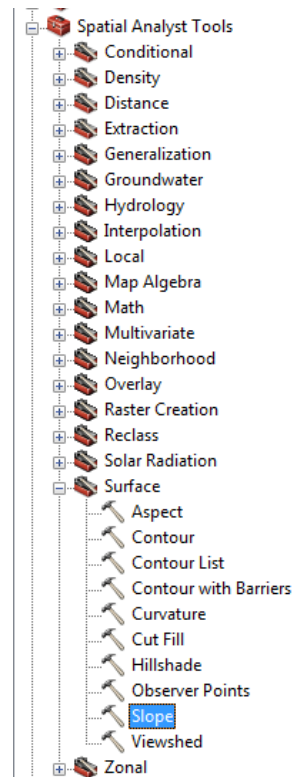
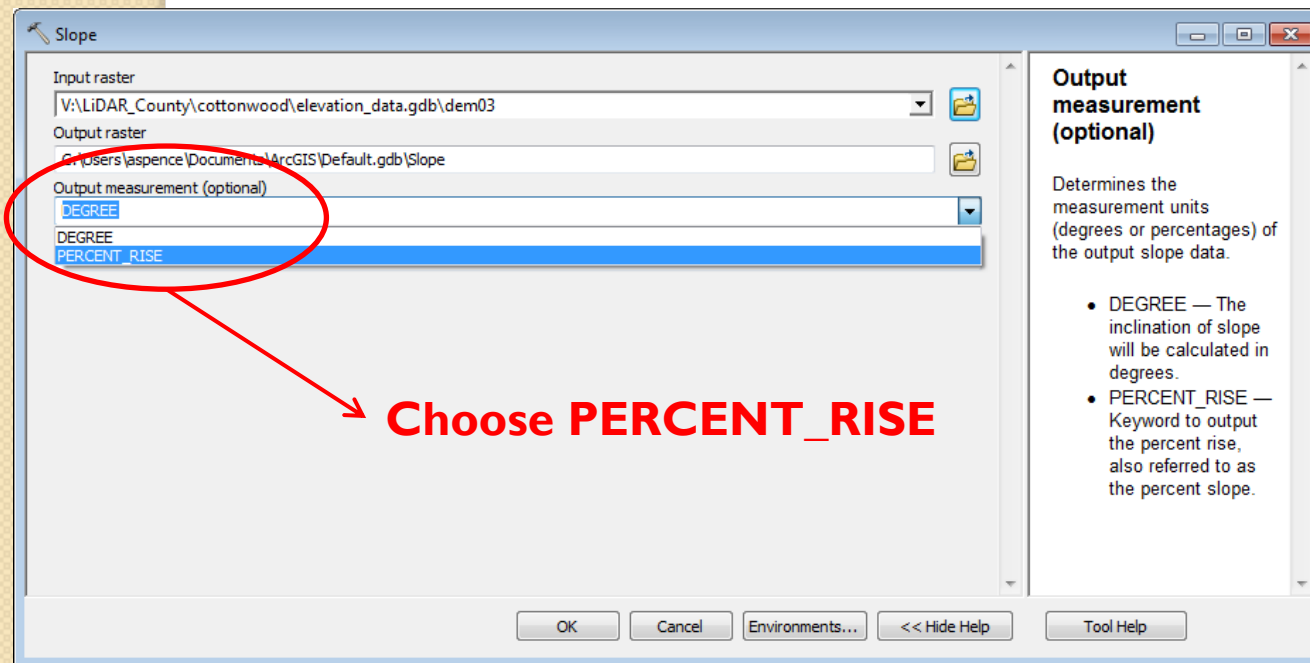
# Topography (MnRAM #26)

- Use ArcGIS Spatial Analyst “Extract by Mask” tool to clip DEM data to DNR minor watershed boundary



# Topography

- Use the Spatial Analyst “Slope” tool to calculate slope values for the sub-watershed




# Terrain Analysis

- U of MN Water Resources Center LiDAR training materials
- For more detailed instruction on beginner to advanced terrain analysis techniques
- Can download all lectures and class exercises for recently conducted LiDAR training sessions

# Terrain Analysis

Campuses : [Twin Cities](#) [Crookston](#) [Duluth](#) [Morris](#) [Rochester](#) [Other Locations](#)

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## Water Resources Center

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The Water Resources Center is affiliated with the [College of Food, Agricultural and Natural Resource Sciences](#) and [University of Minnesota Extension](#).

### LiDAR Training Materials

These training resources were developed as part of the "[Conservation Applications of LiDAR](#)" project - a series of hands-on workshops designed to help Minnesota GIS specialists effectively use LiDAR-derived data to address natural resource issues.

Basics of Using LiDAR Data	
Lecture slides (download)	<a href="#">Basics of Using LiDAR Entire Lecture (4MB pdf)</a>
Lecture slides (online viewer)	<a href="#">Basics Lecture 1: Raster Data and DEMs</a> <a href="#">Basics Lecture 2: About LiDAR Data, Error and Accuracy</a> <a href="#">Basics Lecture 3a: Applications of LiDAR Data, Software</a> <a href="#">Basics Lecture 3b: Representations of LiDAR Data, MN Data Delivery</a> <a href="#">Basics Lecture 3c: Examples of Visualizations of LiDAR Data</a>
Exercises	<a href="#">Raster Processing, MN LiDAR Data, Visualization and Management (2MB pdf)</a>
Terrain Analysis	
Lecture slides	<a href="#">Terrain Analysis (2MB pdf)</a>
Exercises	<a href="#">DEM Pre-processing, Calculating Terrain Attributes, Interpreting Terrain Attributes (1MB pdf)</a>
Exercise videos	<a href="#">Terrain analysis video demonstrations</a>
Hydrologic Applications	
Lecture Slides	<a href="#">Hydrologic Applications (5MB pdf)</a>
Exercises	<a href="#">DEM Display (2MB pdf)</a> <a href="#">DEM Hydrologic Conditioning (1MB pdf)</a>
Arc-GIS	<a href="#">Instructions for installing TPI toolbar for ArcGIS (1MB pdf)</a>

<http://wrc.umn.edu/randpe/agandwq/tsp/lidar/>

# Hydrography

- DNR 24k Stream and Lake Data

## Thematic Classes

Hydrography ▼

## Available Layers

DNR 100K Wetlands  
DNR 24K Lakes  
DNR 24K Streams  
DNR Watersheds - DNR Level 01 - HUC 02  
DNR Watersheds - DNR Level 02 - HUC 04

## Thematic Classes

Hydrography ▼

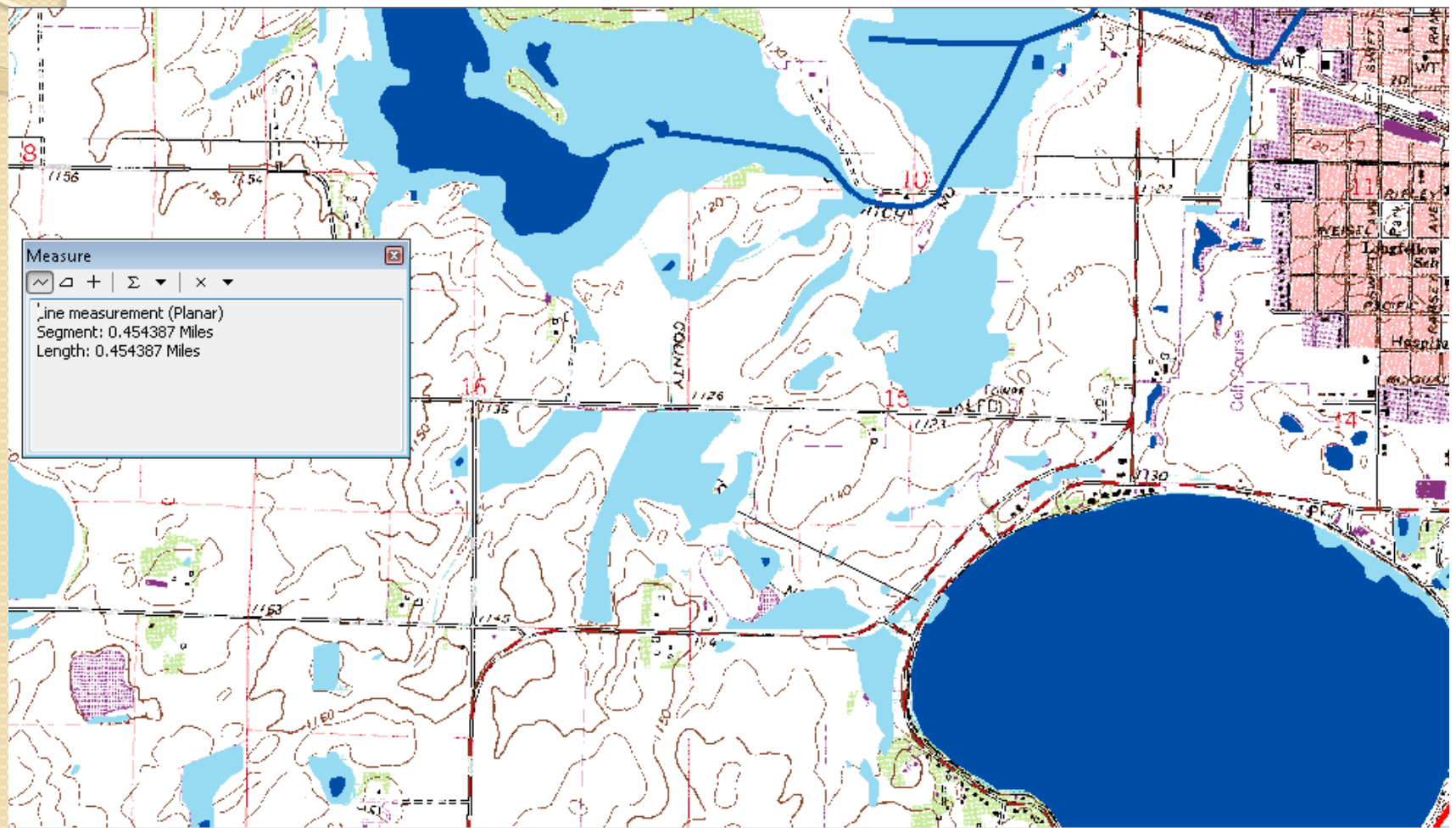
## Available Layers

DNR 100K Streams  
DNR 100K Wetlands  
DNR 24K Lakes  
DNR 24K Streams  
DNR Watersheds - DNR Level 01 - HUC 02

# Hydrography

- **MnRAM Question #27: Describe the proximity of the first recreational lake, recreational watercourse, spawning area or significant fishery, or water supply source down-gradient of the wetland:**
- A = Isolated wetlands *or* wetland with one or more resource within 0.5 mile downstream via any form of channel, pipe.
- B = One or more resource within 0.5 to 2 miles downstream.
- C = No significant resources are located within 2 miles downstream.

# Hydrography



# Much More...

- This presentation provides a baseline of information
- Better GIS skills = More MnRAM assistance
- Seek ArcGIS training
  - Mn DNR
  - Rowekamp Associates Inc.
  - ESRI